May 1991

RUR3040
RUR3050
RUR3060

30A Ultrafast Diode With Soft Recovery Characteristic

T-03-19

Features

- Ultrafast with Soft Recovery Characteristic (t_{rr} < 55ns)
- +175°C Rated Junction Temperature
- Reverse Voltage Up to 600V
- Avalanche Energy Rated

Applications

- Switching Power Supply
- Power Switching Circuits
- General Purpose

Description

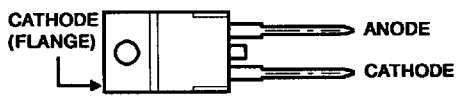
RUR3040, RUR3050, RUR3060 are ultrafast diodes (t_{rr} < 55ns) with soft recovery characteristics ($t_a/t_b \approx 1$). They have a low forward voltage drop and are of planar, silicon nitride passivated, ion-implanted, epitaxial construction.

These devices are intended for use as energy steering/ clamping diodes and rectifiers in a variety of switching power supplies and other power switching applications. Their low stored charge and ultrafast recovery with soft recovery characteristics minimizes ringing and electrical noise in many power switching circuits thus reducing power loss in the switching transistor.

All are supplied in TO-220AC packages.

Package

TO-220AC
TOP VIEW



Symbol

Absolute Maximum Ratings (T_C = +25°C)

		RUR3040	RUR3050	RUR3060
Peak Repetitive Reverse Voltage	V_{RRM}	400V	500V	600V
Working Peak Reverse Voltage	V_{RWM}	400V	500V	600V
DC Blocking Voltage	V_R	400V	500V	600V
Average Rectified Forward Current (Total device forward current at rated V_R and T_C = 150°C)	$I_{F(AV)}$	30A	30A	30A
Peak Forward Repetitive Current (Rated V_R, square wave 20kHz)	I_{FRM}	70A	70A	70A
Nonrepetitive Peak Surge Current (Surge Applied at rated load condition halfwave 1 phase 60Hz)	I_{FSM}	325A	325A	325A
Operating and Storage Temperature	T_{STG}, T_J	-55°C to +175°C	-55°C to +175°C	-55°C to +175°C

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ULTRA-FAST RECTIFIERS

File Number 2776.1

Electrical Characteristics (T_C = +25°C) Unless Otherwise Specified.

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SYMBOL	TEST CONDITION	RUR3040 LIMITS			RUR3050 LIMITS			RUR3060 LIMITS			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_F	I_F = 30A, T_C = +150°C	-	-	1.30	-	-	1.30	-	-	1.30	V
	I_F = 30A, T_C = +25°C	-	-	1.50	-	-	1.50	-	-	1.50	V
IR @ T_C = +150°C	V_R = 400V	-	-	1	-	-	-	-	-	-	mA
	V_R = 500V	-	-	-	-	-	1	-	-	-	mA
	V_R = 600V	-	-	-	-	-	-	-	-	1	mA
IR @ T_C = +25°C	V_R = 400V	-	-	30	-	-	-	-	-	-	µA
	V_R = 500V	-	-	-	-	-	30	-	-	-	µA
	V_R = 600V	-	-	-	-	-	-	-	-	30	µA
t_{rr}	I_F = 1A	-	-	55	-	-	55	-	-	55	ns
	I_F = 30A	-	-	60	-	-	60	-	-	60	ns
t_a	I_F = 1A	-	20	-	-	20	-	-	20	-	ns
	I_F = 30A	-	38	-	-	38	-	-	38	-	ns
t_b	I_F = 1A	-	15	-	-	15	-	-	15	-	ns
	I_F = 30A	-	20	-	-	20	-	-	20	-	ns
$R_{\Theta jc}$		-	-	1.2	-	-	1.2	-	-	1.2	°C/W
W_{avl}	see Fig. 7&8	-	-	20	-	-	20	-	-	20	mj

Definitions

V_F = Instantaneous forward voltage (pw = 300µs, D = 2%).

I_R = Instantaneous reverse current (pw = 300µs, D = 2%).

t_{rr} = Reverse recovery time at dI_F/dt = 100A/µs (See Figure 2), summation of t_a + t_b.

t_a = Time to reach peak reverse current at dI_F/dt = 100A/µs (See Figure 2).

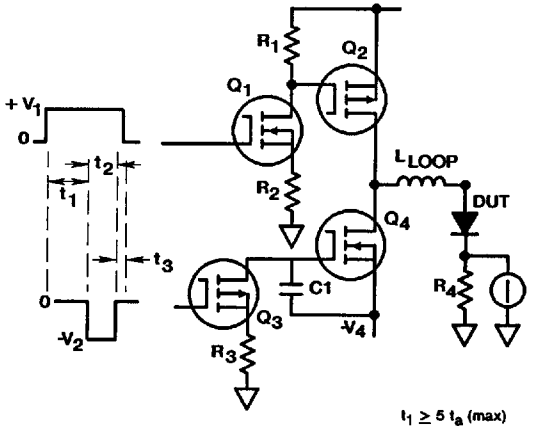
t_b = Time from peak I_{RM} to projected zero crossing of I_{RM} based on a straight line from peak I_{RM} through 25% of I_{RM}. (See Figure 2)

$R_{\Theta jc}$ = Thermal resistance junction to case.

W_{avl} = Controlled avalanche energy (See Figures 7 & 8).

pw = pulse width.

D = duty cycle.



$t_1 \geq 5\ t_a$ (max)
$t_2 > t_{rr}$
$t_3 > 0$
$\frac{L_1}{R_4} \leq \frac{t_a(min)}{10}$

V_1 amplitude controls I_F
V_2 amplitude controls di/dt
L_1 = self inductance of R_4

FIGURE 1. t_{rr} TEST CIRCUIT

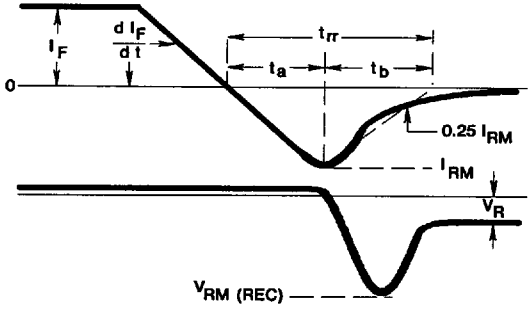


FIGURE 2. DEFINITIONS OF t_{rr}, t_a AND t_b

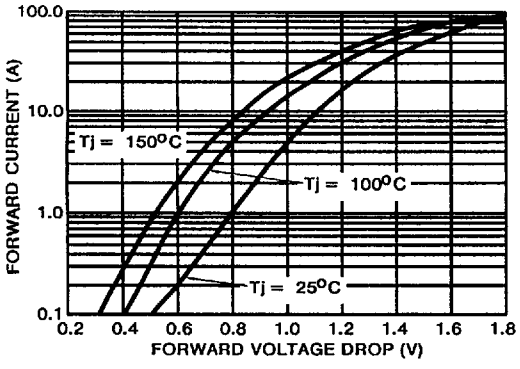


FIGURE 3. FORWARD VOLTAGE vs FORWARD CURRENT CHARACTERISTIC

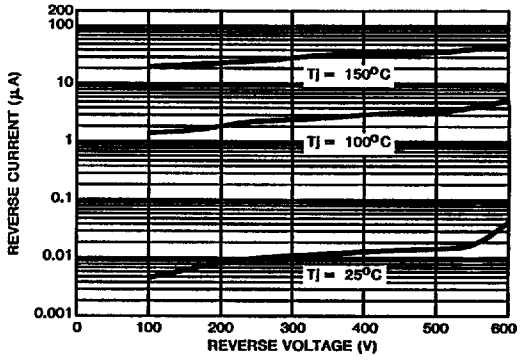


FIGURE 4. REVERSE VOLTAGE vs REVERSE CURRENT CHARACTERISTIC

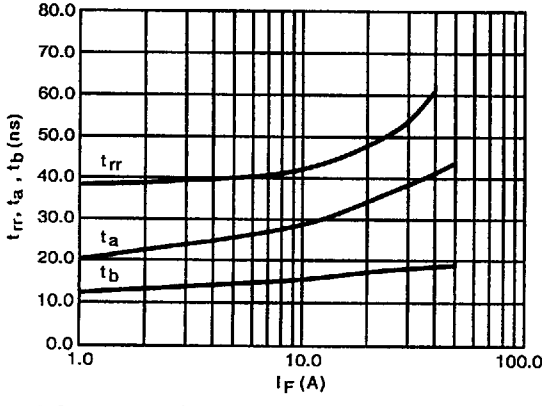


FIGURE 5. TYPICAL t_{rr}, t_a, t_b vs FORWARD CURRENT

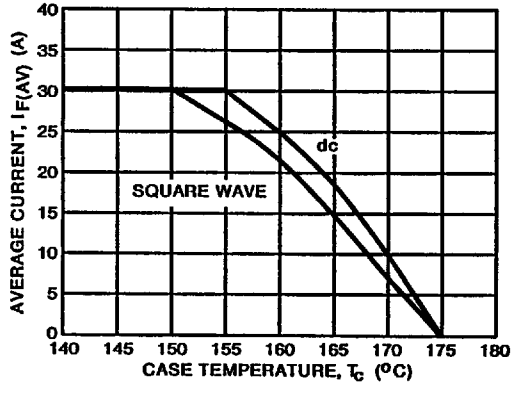


FIGURE 6. TYPICAL CURRENT DERATING CURVE w.r.t. CASE TEMPERATURE

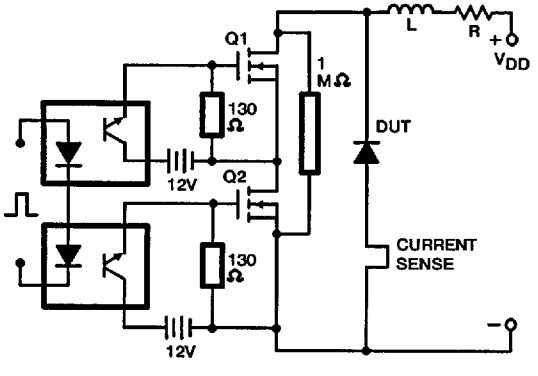


FIGURE 7. AVALANCHE ENERGY TEST CIRCUIT

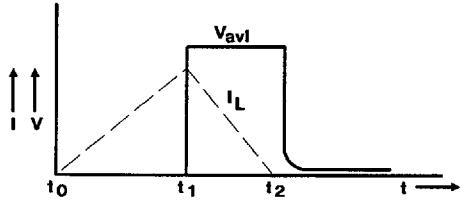


FIGURE 8. CURRENT VOLTAGE WAVEFORM

$I_L$peak = 1A, L = 40mH, R < 0.1Ω, $W_{avl} = (1/2)\ LI^2[V_{avl}/(V_{avl}-V_{dd})]$